

1   **1.** A method of ensuring that a first component of a distributed system that normally has  
 2   access to certain messages from other components thereof is additionally aware of a state  
 3   of one or more of the other components that is relevant to an action performed by the first  
 4   component,

5   the method comprising the steps practiced in the first component of:

6         receiving augmented ones of the certain messages, each of the augmented certain  
 7   messages having been augmented by an other component to additionally contain  
 8   information indicating the relevant state of the other component;

9         for at least some of the other components, retaining the relevant state from an  
 10   augmented message of the other component; and

11        performing the action as determined by the retained relevant state.

1   **2.** The method set forth in claim 1 wherein:

2         the messages are part of a transaction;

3         the action belongs to the first component's portion of a protocol for ensuring that  
 4   the results of the transaction are consistent in the components;

5         in the step of receiving augmented ones of the certain messages, the information  
 6   indicating the relevant state indicates whether the transaction will modify data in the  
 7   other component; and

8         in the step of performing the action, the first component optimizes the protocol as  
 9   determined by the retained state.

1     **3.** The method set forth in claim 2 wherein:

2             the protocol is a two-phase commit protocol;

3             the first component is the coordinator for the protocol; and

4             in the step of performing the action, the first component sends a message that  
5     aborts the transaction to an other component when the other component's retained state  
6     indicates that the transaction does not modify the data in the other component.

1     **4.** The method set forth in claim 3 wherein:

2             the distributed system is a distributed database system and the components are  
3     database systems therein.

1     **5.** A method of ensuring that a first component of a distributed system that normally  
2     accesses messages that belong to a transaction and that are received from other  
3     components thereof is additionally aware of a state of one or more of the other  
4     components that is relevant to the transaction,  
5     the method comprising the steps practiced in the other component of:

6             determining the relevant state; and

7             augmenting certain of the messages sent in the course of the transaction with state  
8     information indicating the relevant state of the other component,  
9     the first component determining an action to be taken with regard to the transaction from  
10    the state information.

1     **6.** The method set forth in claim 5 wherein:

2 the relevant state indicates whether the transaction will modify data in the other  
3 component.

1 **7.** The method set forth in claim 6 wherein:

2 the protocol is a two-phase commit protocol; and

3 the other component receives an abort message of the protocol when the relevant  
4 state indicates that the transaction will not modify the data in the other component.

1 **8.** The method set forth in claim 7 wherein:

2 the distributed system is a distributed database system and the components are  
3 database systems therein.

1 **9.** A method of executing a two-phase commit protocol for a transaction, the transaction

2 involving a coordinator and a cohort and

3 the method comprising the steps performed in the coordinator of:

4 receiving a message required for the transaction from the cohort, the message  
5 being augmented with state information indicating whether the transaction modifies the  
6 cohort's data;

7 retaining the state information for the cohort; and

8 if the state information for the cohort indicates that the transaction does not  
9 modify the cohort, sending an abort message of the two-phase commit to the cohort.

- 1   **10.** A method of executing a two-phase commit protocol for a transaction, the transaction  
2   involving a coordinator and a cohort and  
3   the method comprising the steps performed in the cohort of:  
4       augmenting a message that the cohort sends to the coordinator as part of the  
5   transaction with state information indicating whether the transaction will modify the  
6   cohort; and  
7       responding to messages received from the coordinator as required by the commit  
8   protocol,  
9   the coordinator sending a message of the commit protocol to the cohort as determined by  
10   the state information.